ABSTRACT

A long-distance, high bit-rate optical communications link is described comprising an optical transmitter, an optical receiver, and an index-guiding microstructured optical fiber between the optical transmitter and the optical receiver, the microstructured optical fiber having a majority of the cross-section of the core and cladding regions occupied by voids. The voids are dimensioned such that an effective index of refraction of the cladding region is less than an effective index of the core region, the optical fiber propagating light by an index-guiding effect. The attenuation and dispersion characteristics of the microstructured optical fiber, when expressed in dB/km and ps/(nm-km), respectively, each decrease in approximate proportion to the percentage of cross-sectional area occupied by the voids. An appropriate void-to-cross-sectional area ratio may be selected so as to provide an optical communications link that provides substantially increased data throughput using today's installed base of conduit and communications relay stations. Alternatively, current data throughput rates may be preserved, while system hardware requirements are substantially decreased in terms of regenerator spacing, optical amplifier spacing, dispersion-compensating fiber lengths, optical filtering device precisions, and/or optical source device precisions, thereby decreasing the costs of system construction and maintenance and improving system reliability.